CLAIMS

1. A hydrorefining unit for hydrorefining hydrocarbon feed oil including sulfur-containing compounds, comprising:

a first catalyst layer and a second catalyst layer;

a holding member positioned between the first catalyst layer and second catalyst layer for temporarily holding a liquid component that flows out from the first catalyst layer;

a hydrogen feed source; and

a hydrogen introduction part connected to the hydrogen feed source, for simultaneously introducing hydrogen from the hydrogen feed source to the liquid component held in the holding member and the second catalyst layer.

2. A hydrorefining unit according to Claim 1, wherein the hydrogen introduction part is arranged on the downstream of the holding member and on the upstream of the second catalyst layer.

3. A hydrorefining unit according to Claim 1, wherein the first catalyst layer, second catalyst layer, and holding member are housed in a single reaction vessel.

4. A hydrorefining unit according to Claim 1, wherein the holding member is a tray which has a discharge hole for liquid component and in which liquid component accumulates.

5. A hydrorefining unit according to Claim 1, wherein the holding member is a packing material through which liquid component can pass.

6. A hydrorefining unit according to Claim 1, wherein the hydrogen introduced from the hydrogen introduction part has a first hydrogen gas stream and a second hydrogen gas stream, with the first hydrogen stream passing through the holding member as a countercurrent to the liquid component that flows out from the first catalyst layer and the second gas stream being introduced to the second catalyst layer as a cocurrent with the liquid component that flows out from the holding member.

7. A hydrorefining unit according to Claim 6, wherein impurities are stripped from the liquid component held in the holding member by the first hydrogen gas stream.

8. A hydrorefining unit according to Claim 7, wherein the impurities are hydrogen sulfide and/or ammonia.

9. A hydrorefining unit according to Claim 1, wherein the hydrocarbon feed oil is hydrocarbon feed oil with a 90% distillation temperature of 250°C.

10. A hydrorefining unit according to Claim 1, further comprising a separation space for separation of vapor component and liquid component that is positioned at the bottom of the first catalyst layer and a gas outlet through which the vapor component is discharged from the separation space.

11. A method for hydrorefining hydrocarbon feed oil including a sulfur-containing compound using at least two catalyst layers, comprising the steps of:

introducing hydrocarbon feed oil to the first catalyst layer together with hydrogen;

stripping a liquid component that has flown out from the first catalyst layer with a first hydrogen gas stream that is fed from the hydrogen introduction part; and

introducing the stripped liquid component to the second catalyst layer together with a second hydrogen gas stream that is fed from the hydrogen introduction part.

12. A hydrorefining method according to Claim 11, wherein the hydrogen introduction part is provided between the first catalyst layer and the second catalyst layer.

13. A hydrorefining method according to Claim 11, wherein the liquid component that flows out from the first catalyst layer is temporarily held using a holding member.

14. A hydrorefining method according to Claim 13, wherein the first hydrogen gas stream and the second hydrogen gas stream are introduced between the holding member and the second catalyst layer.

15. A hydrorefining method according to Claim 13, wherein the holding member is a tray which has a liquid discharge hole and in which liquid component accumulates.

16. A hydrorefining method according to Claim 13, wherein the holding member is a packing material through which the liquid component can pass.

17. A hydrorefining method according to Claim 11, wherein the second hydrogen gas stream is introduced together with the stripped liquid component as cocurrent with the liquid component.

18. A hydrorefining method according to Claim 11, further comprising the step of:

removing a vapor component that has been produced from the first catalyst layer and removing a vapor component that has been produced by stripping.

19. A hydrorefining method according to Claim 11, wherein the hydrocarbon feed oil is hydrocarbon oil which 90% distillation temperature is 250°C or higher.